

<p><b>Content/Units</b></p>	<p><b>Disciplinary Knowledge (Skills)</b> This is the actions taken within a topic to gain substantive knowledge</p>	<p><b>Substantive Knowledge</b> This is the specific, factual content for the topic, which is connected into a careful sequence of learning</p>	<p><b>Prior Learning</b></p>	<p><b>Future learning (Y13)</b></p>
<ul style="list-style-type: none"> <li>• Algebraic expressions</li> <li>• Graphs and transformations</li> <li>• Coordinate geometry including circles</li> <li>• Vectors</li> <li>• Trigonometry</li> <li>• Exponentials and logarithms</li> <li>• Binomial expansion</li> <li>• Differentiation</li> <li>• Integration</li> <li>• Representing data</li> <li>• Probability distributions and testing</li> <li>• Kinematics</li> <li>• Newton's laws</li> <li>• Mathematical proof</li> </ul>	<ul style="list-style-type: none"> <li>• Use laws of indices to simplify expressions and solve equations</li> <li>• Use a variety of methods to solve quadratic equations formed from a practical situation</li> <li>• Find and use equations of straight lines, circles and parabolas</li> <li>• To use and manipulate exponential and logarithmic equations</li> <li>• Solve trig equations, finding all solutions within a given range</li> <li>• Differentiate polynomials to find gradients and turning points</li> <li>• Use integration to find equations of curves or the area underneath them</li> <li>• Use a graphical calculator to solve equations, draw graphs and investigate probability distributions</li> <li>• Write vectors in <math>i</math> and <math>j</math> notation</li> </ul>	<ul style="list-style-type: none"> <li>• Know how to manipulate polynomials to find a solution and interpret its meaning.</li> <li>• Know the connections between parallel and perpendicular lines and their link the geometric shapes</li> <li>• Understand the exponential growth is and how it can relate to a rate of change.</li> <li>• How to reduce an exponential graphs to linear form using logs</li> <li>• Recognise when to use different methods for finding probabilities based on the format of the information</li> <li>• To appreciate statistical terminology and understand how this relates to the process to be used.</li> <li>• Interpret what the value of the discriminant shows</li> </ul>	<ul style="list-style-type: none"> <li>• Find and use equations of straight lines.</li> <li>• Plot and read from various non-linear graphs both algebraic and applied.</li> <li>• Solve simultaneous equations</li> <li>• Expand and factorise quadratics.</li> <li>• Solve quadratic equations.</li> <li>• Change the subject of formulae.</li> <li>• Find outputs and inputs of functions.</li> <li>• Find missing sides and angles using Pythagoras and trigonometry.</li> <li>• Use data to compare distributions.</li> <li>• Illustrate equivalence algebraically.</li> <li>• Know the rules for indices.</li> </ul>	<ul style="list-style-type: none"> <li>• Develop methods to differentiate/integrate composite functions, products and quotients</li> <li>• Enhance use of trigonometric identities to include double angles and compound angles.</li> <li>• Discovery of graphs of more complex functions and the connections between them</li> <li>• Use knowledge of probability to support claims</li> <li>• Scrutiny of sequences, their patterns and summations</li> <li>• Geometric applications of vectors</li> <li>• Further numerical methods to find roots of polynomials</li> </ul>

**The Big Picture – Intent:**

Y13 Mathematics is designed to maximise progression in preparation for Y13 Examination and Maths at Degree Level. Many topics presents opportunities to recap on Year 12 covered content linking this to brand new Year 2 A-Level content. All topics give students the chance to extended themselves on the journey to achieving their potential.

The learning programme is designed so that students should be able to select and correctly carry out routine procedures, accurately recalling facts, terminology, and definitions. They should be able to reason, interpret and communicate mathematically, constructing rigorous mathematical arguments (including proofs) to make deductions and inferences. They would be encouraged to assess the validity of mathematical arguments, explain their reasoning; and use mathematical language and notation correctly. Lessons will include time helping pupils to translate problems in mathematical and non-mathematical contexts into mathematical processes, interpret solutions to problems in their original context, and, where appropriate, evaluate their accuracy and limitations. Use mathematical models and the evaluation their outcomes enables pupils to recognise the limitations of models and, where appropriate, explain how to refine them.

**Implementation:**

Lessons are split between 3 teachers. 2 teachers have 4 lessons a fortnight sharing the pure and statistics content with the third teacher doing a small amount of pure and all the mechanics during 2 lessons a fortnight.

Lessons are based around developing a deeper understanding od concepts. Reasoning will be developed through exploration of mathematical patterns and looking where possible at proofs. Solving problems in different ways will be investigated where possible to demonstrate the many wonderful links in mathematics.

Formal structures to answering A level questions will be embedded as will numeracy and calculator skills specific to A level.

**Key Summative Assessments:**

Formal Assessment Autumn (2), Spring( 1) plus Mocks.

Y13 January Mocks

Y13 March Mocks

Mixture of DFM Retrieval and paper based homework as well as some instances of flipped learning.

Live marking and low stakes quizzing when needed.

Students have separate independent study books which are monitored and checked half termly.

**Autumn Term:**

Algebraic Methods, Binomial Expansion, Differentiation, Proof, Trigonometry, Vectors, Sequences and Series, Moments. Projectiles.

**Spring Term:**

Projectiles(cont'd), Forces, Integration, Regression and correlation, functions, parametric equations.

Mock Exams (1)

**Summer term:**

Normal distribution, Integration (cont'd), parametric equations (cont'd), numerical methods, probability, Forces (cont'd), Kino.

**Impact:**

Students will have increased understanding and confidence in Maths and be able to apply new skills to a variety of new and challenging mathematical problems. Students will know more and remember more. There will be an increase in attainment, evidenced in regular, formal and interleaved assessments.

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<ul style="list-style-type: none"> <li>• Algebraic methods</li> <li>• Functions and graphs</li> <li>• Sequences and series</li> <li>• Binomial expansion with negative or fractional powers</li> <li>• Radians and further trigonometry</li> <li>• Parametric equations</li> <li>• Further differentiation</li> <li>• Implicit differentiation</li> <li>• Numerical methods</li> <li>• Further integration</li> <li>• Partial fractions</li> <li>• Vectors in 3 dimensions</li> </ul>	<ul style="list-style-type: none"> <li>• Four rules of fractions in algebraic form</li> <li>• Split into partial fractions</li> <li>• Use the formula to expand a binomial</li> <li>• Convert between degrees and radians</li> <li>• Differentiate a variety of functions including composites, exponentials, logarithms and trig</li> <li>• Use implicit differentiation for equations where x and y are not separable</li> <li>• Use parametric methods for situations involving a 3<sup>rd</sup> variable</li> <li>• Use sign change, iteration and Newton-Raphson to solve equations</li> <li>• Find areas using integration or approximations</li> <li>• Use integration methods such as substitution and by parts</li> </ul>	<ul style="list-style-type: none"> <li>• Recognise when each differentiation method is appropriate</li> <li>• Apply relevant trigonometric identities to an equation to prove a link or solve an equation</li> <li>• Construct extended arguments to solve problems presented in an unstructured form, including problems in context.</li> <li>• Construct and present mathematical arguments through appropriate use of diagrams; sketching graphs; logical deduction; precise statements involving correct use of symbols and connecting language</li> <li>• Understand that many mathematical problems cannot be solved analytically, but numerical methods permit solution to a required level of accuracy.</li> </ul>	<ul style="list-style-type: none"> <li>• Algebraic expressions</li> <li>• Graphs and transformations</li> <li>• Coordinate geometry including circles</li> <li>• Vectors</li> <li>• Trigonometry</li> <li>• Exponentials and logarithms</li> <li>• Binomial expansion</li> <li>• Differentiation</li> <li>• Integration</li> <li>• Representing data</li> <li>• Probability distributions and testing</li> <li>• Kinematics</li> <li>• Newton's laws</li> <li>• Mathematical proof</li> </ul>	<ul style="list-style-type: none"> <li>• Extend calculus techniques to include partial and multiple differentiation and integration</li> <li>• Eigenvalues and eigenvectors</li> <li>• Laplace transforms</li> <li>• Analysis</li> <li>• Numerical analysis</li> <li>• Discrete mathematical structures including Boolean algebra</li> </ul>